CITY WATER SUPPLY AND FILTRATION.

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BY

W. P. WHITE, M. D.

Health Officer of the City of Louisville, Kentucky.

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CITY WATER SUPPLY AND FILTRATION.

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The supply of an abundant quantity of pure water, best fitted for drinking and other dietetic uses, to cities and towns has become one of the most important topics which can engage public attention. The habits incident to an advancing civilization involve continually the consumption of a larger amount of water per head of the population. The procurement, besides a sufficient supply and distribution, of proper wholesomeness in the water is a very serious problem with many of our larger cities. The connection of purity of the water used for domestic purposes with the condition of the public health has been proved most conclusively; and it is found that the ravages of epidemic diseases in any district are widespread and fatal very nearly in the proportion of the impurity of the water, especially in organic contamination, supplied for the use of the inhabitants.

The condition and quality of the water supply and its influence on the public health being irrefutable, sanitary rules, based on the most careful study, should aim to secure a quality of water which will satisfy the requirements of the most advanced hygienic regulations for potable water.

All natural water is more or less contaminated by foreign matters. The impurities present in natural waters are mechanical, gaseous, dissolved mineral and organic impurities; organic suspended impurities consisting of animal and vegetable organisms, either living or dead, of animal remains and refuse, and of vegetable matter. Of soluble organic impurities the vegetable matters are not usually of a very deleterious character, but it is the animal matters which are most dangerous, and are frequently the means of spreading contagious diseases. A polluted water supply is one of the greatest of disease breeders, containing a large number of bacteria, many of which are disease-producing germs. It is the universal opinion of all investigators that typhoid fever is a water-carried disease. While typhoid fever is the most important one in its disastrous results, there can be no doubt that other diseases owe their existence directly to the use of polluted water, and that the use of such water is detrimental to the general health.

Rain water, collected at a distance from inhabited places and upon insoluble surfaces of rock or sand, is the purest kind of natural water. Yet even common rain water is usually yellowish on account of the fine dust, smoke, and other impurities which it gathers in falling through the air. But after it has been strained through the earth it is sweet, clear, and bright, because the beds of sand and gravel through which it trickles are natural filters which take out all colors and impurities.

The common and most eligible sources of public water supply are rivers and lakes. These are by far the most available, and usually supply all requirements excepting that of hygiene; and only with methods devised for eliminating from their waters all organic matter and bacteria inimical to health can they be wholly satisfactory.

Chemical and biological examinations demonstrate that river water is at all times, and occasionally grossly, polluted. Every one recognizes the dangers lurking in water from a large river carrying the sewage and drainage from many thousand square miles of settled and built-up territory, and made the channel for the waste and filth of every city and town on its banks and on the banks of its tributaries. Since the adoption and extended use of water-closets the waste-water of towns has become more offensive than in the old days of privies and cesspools it used to be, and therefore the consequent increasing pollution of the rivers. And it can not be claimed that the germs productive of typhoid fever and other diseases communicable by ingestion are removed or destroyed by the self-purification of these streams.

The Ohio River water unpurified can scarcely be classed among safely potable waters. Before it reaches Louisville the Ohio River receives the sewage and surface drainage from many cities and towns, aggregating a population of probably two millions of people; carrying, with the sewage of these two millions of people and the urban drainage from the cities and towns on its banks, the germs of all infectious diseases directly or indirectly coming into it from this vast territory and population. The result of this contamination is forcibly illustrated by the vital statistics compiled from official reports of health departments. For the three principal cities taking their water supply from the Ohio River or its tributaries the death-rates from typhoid fever are reported to be for the calendar year 1895:

Pittsburgh, 77 per 100,000 population;
Cincinnati, 36 per 100,000 population;
Louisville, 77 per 100,000 population.

On the other hand, in New York, Boston, and Brooklyn, which depend upon impounded water gathered in large reservoirs and carried in storage for many months, the typhoid-fever death-rates are, by the last reports, shown to be:

New York, 17 per 100,000 population;
Boston, 28 per 100,000 population;
Brooklyn, 16 per 100,000 population.

And in Vienna and Munich, where the water is obtained from springs in mountainous districts, the death-rate from typhoid is reduced to 7.0 and 7.1 respectively per 100,000 population.

Where a city's water supply is available only from sources within reach of sewage and drainage contamination, the best methods in vogue for the purification of the water should be adopted. The water, before distribution to the people for domestic uses, must be subjected to such treatment as to make it comply with the requirements of the highest practical standards for purity.

Sedimentation and filtration may not furnish chemically and bacterially pure water, but viewed from a practical standpoint such water will be so far advanced in purity and in the arrest of disease germs that no one can object to its use for all purposes. The purification of polluted river water obtained by filtration combined with proper subsidence has accomplished the most satisfactory results. The introduction of filters at Hamburg is credited with reducing the death-rate from typhoid fever from 28 to 6 per 100,000 population. After the filters of the London water-works were operated to meet the requirements of a bacterial standard, the typhoid rates fell from nearly 90 deaths per 100,000 of population for the decade 1861–70 to 24 for the decade 1871–80, 19 for the decade 1881–90, and finally to 15 per 100,000 of the population for the period 1890–94. In a recent discourse by Dr. Frankland before the Royal Institution of London, referring to the uniformly excellent filtration that had been reached in the water supply of London since filtration was made compulsory in 1856, he said, "that the effect of sand filtration, as carried out by the London water companies, upon the living matter contained in raw water was simply astounding. A single drop of unfiltered Thames water sometimes contained nearly 3,000 separate living organisms, but after filtration only two or three would be found, and sometimes the filtered water was absolutely sterile."

Mr. Hazen, late chemist of the Massachusetts State Board of Health, states that "in parts of Germany, where the water is of exceptional purity and under governmental control, typhoid fever has ceased nearly to exist."

The change of source from the two-mile to the four-mile intake crib of the Chicago water supply reduced the typhoid-fever death-rate from 104 in 1892 to 42 and 31 in 1893 and 1894, respectively, per 100,000 population. In fact it is established that the spread of diseases such as cholera and typhoid through the agency of drinking-water is occasioned by living organisms of extreme minuteness; and vital statistics furnish conclusive proof that high quality of water supply goes hand in hand with low typhoid-fever rates and a general betterment of the public health.

The Louisville Water Company is at present making tests of the various systems of filtration, and is exhibiting a commendable desire, by persistent and intelligent investigations, to ascertain the best method of purification, with the purpose to construct a filtration plant that will supply our people with a quality of water which, as far as practicable, shall equal the water of any large city in the country. When this is done the wells and pumps, of which we have 653—open or wood pumps numbering 532 and tube wells numbering 121—should be condemned and filled as fast as analysis shows them to be impure, and the use of hydrant water delivered through the public mains substituted. The changes in our domestic habits which involved the construction of sewers for conducting away the refuse from every house have led to the more or less contamination of wells and pumps by infiltration from the sewers, receiving considerable of the sewage and all surface drainage. It is certain that money, labor, and study can not be spent to better advantage than in meeting the demand for a public water supply which certainly shall not be the cause of disease and death in our households.

LOUISVILLE.